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| DocCoverBackground | CORE FLIGHT SYSTEM  Data Storage  BUILD 2.4.0.0  FLIGHT SOFTWARE BUILD VERIFICATON  TEST REPORT  Flight Software Branch – Code 582  Version 1.0 |

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Plan Update History

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# Introduction

## Document Purpose

This Test Report describes the test results from the Core Flight System (CFS) Data Storage (DS) Flight Software (FSW) Test Team build 2.4.0.0 verification testing. It is used to verify that the DS FSW has been tested in a manner that validates that it satisfies the functional and performance requirements defined within the CFS DS Requirements Document. This Test Report summarizes the FSW test history, the build verification process, the build test configuration, and the test execution and results.

## Applicable Documents

Unless otherwise stated, these documents refer to the latest version.

**Parent Documents** (Mission and FSW)

* 582-2008-008 CFS Data Storage Requirements Document, Version 1.2
* 582-2008-012 CFS Deployment Guide, Version 3.0

**Reference Documents**

All of the references below can be found on the Code 582 internal website at <http://fsw.gsfc.nasa.gov/>

* 582-2003-001 FSB FSW Test Plan Template
* 582-2004-001 FSB FSW Test Description Template
* 582-2004-002 FSB FSW Test Scenario Template
* 582-2004-003 FSB FSW Test Procedure Template
* 582-2004-004 FSB FSW Test Execution Summary Template
* 582-2004-005 FSB Test Product Peer Review Form
* 582-2000-002 FSB FSW Unit Test Standard

## Document Organization

Section 1 of this document presents some introductory material.

Section 2 provides a flight software overview and context along with the test history and testing overview.

Section 3 describes the build verification process including procedure development and execution and test products produced.

Section 4 describes the build test configuration which includes an overview of the testbed and the requirements verification matrix.

Section 5 describes the test execution and results by subsystem.

Appendix A - provides the Requirements Traceability Matrix

Appendix B - provides the Command, Telemetry, and Events Verification Matrix

## Definitions

There were 3 verification methods used during build verification testing. They were:

* Demonstration: Show compliance with system requirement by exhibiting the required capability (e.g. by demonstrating interactive capability, display capability, print capability, etc.
* Inspection: Show compliance with a system requirement by visual verification of the software (e.g. verifying preparation for delivery, proper interfacing)
* Analysis: Perform detailed analysis of code, generated data (both intermediate data and final output data), etc., to determine compliance with system requirements.

The fields in the Requirements Verification Matrix in Section 4.3 are defined as follows:

* Requirements Tested Passed: Requirement was fully tested in a build test procedure and passed all tests.
* Requirements Tested Failed: Requirement was fully tested in a build test procedure and failed one or more aspect of the testing.
* Requirements Tested Partially: Requirement was tested partially in a build test procedure. To be fully tested, the partially tested requirement is either tested additionally in one or more other test procedures within the same build **and/or** other aspects of the requirement must be tested in a later build, due to capabilities not present in the current build
* Total Tested: Total number of requirements fully tested in a build test procedure. Includes total passed and total failed, but does **not** include requirements tested partially, **unless** (included as a separate entry) testing in multiple procedures within the same build constitutes total testing of a particular requirement. Total Requirements Tested is computed this way in order to avoid multiple counting of individual requirements that are tested partially in more than one procedure.
* Deferred: Number of requirements that were planned to be tested in current build, but were not tested due to some FSW capability or necessary system component not being present.
* Total: Total Requirements Tested + Number of Requirements Deferred

In each software test section in Section 5 there is a table of DCR’s. The state definitions are as follows:

* Opened: The DCR is currently being addressed
* Assigned: The DCR was accepted and the modification is being addressed
* InTest: The DCR was corrected and is currently in test
* Validated: The DCR was corrected and tested and has been validated, needs to have a CCB to close the DCR
* Closed: The DCR is closed and have been resolved and tested to satisfaction
* Closed with Defect: The DCR is closed and the defect is most likely assigned a differed DCR number associated with another subsystem.

# OVERVIEW

## Flight Data System Context

Figure 2-1 illustrates the CFS system context. The core Flight Executive (cFE) interfaces to five external systems: an [Operating System](#Operating_System) (OS), a [Hardware Platform](#Hardware_Platform) (HP), an [Operational Interface](file:///C:\Users\wmoleski\Documents\Projects\cFE\CFS\Data%20Storage\Testing\2.4.0.0\Operational_Interface) (OI), [Applications](#Application) (APP), and other cFE-based systems.



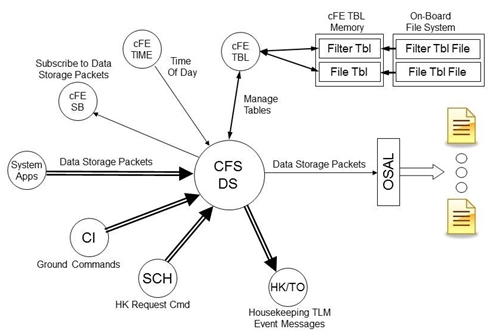
**Figure 2-1 CFS System Context**

Figure 2-2 below shows context diagram for the CFS Data Storage (DS) Application.  During initialization, DS subscribes to messages from other applications as defined in the Data Storage Filter Table. The Scheduler Application (SCH) sends periodic commands to DS as defined in the SCH Schedule Table which requests housekeeping from DS (note that a mission must define this request in the SCH table). Ground commands come from the Command Ingest task (CI). Messages are routed to DS by the cFE Software Bus (SB) Application. DS learns of ground updates to the DS tables through the cFE Table Services application.

 DS defines 2 tables:

1.        Filter Table – for each message ID, specifies filter scheme, filter parameters and which file or files to write the message to.  Note that each message can be written to a <PLATFORM\_DEFINED> number of destination files.

2.        File Table – specifies information about each destination file.



**Figure 2-2 CFS DS Context**

## Test History

DS 2.0.0.0 – Build Verification Testing completed 12/2/2009 by Walt Moleski

DS 2.1.1.0 – Build Verification Testing completed 1/5/2011 by Walt Moleski

DS 2.2.0.0 – Build Verification Testing completed 9/19/2011 by Walt Moleski

DS 2.3.0.0 – Build Verification Testing completed 7/31/2012 by Walt Moleski

DS 2.4.0.0 – Build Verification Testing completed 1/23/2015 by Walt Moleski

## Testing Overview

The CFS Test procedures assume that the CFS application and its corresponding test application are not executing before the start of the test. If this is the case, the test procedures will need to be modified to handle this situation.

The DS application was tested during Build Verification testing using the following:

* 1 test application: tst\_ds
* 6 main test procedures: ds\_filewrite.prc, ds\_filter.prc, ds\_gencmds.prc, ds\_movefile.prc, ds\_resetcds.prc, ds\_resetnocds.prc
* 7 procedures that setup the Packet Filter and Destination File Tables: ds\_tbl1.prc, ds\_tbl2.prc, ds\_tbl3.prc, ds\_tbl4.prc, ds\_tbl5.prc, ds\_badfiletbls.prc, and ds\_badfiltertbls.prc
* 1 procedure called by the main procedures to startup the DS and TST\_DS applications: ds\_start\_apps.prc
* All tests require the ASIST Ground Station

The TST\_DS test application is used to send schedule requests for the output of DS’s housekeeping data to the DS application. This was useful when performing build verification testing since it provided great control over the sequence of steps. In addition, having the test application eliminated the need to modify the SCH\_LAB application and rebuild. When deployed for a mission, the Scheduler Application would provide this request. In addition, the test application has 5 ground commands defined to help with the DS testing. These commands are described below:

* TST\_DS\_NOOP
  + This command that issues an event and increments the command processed counter.
* TST\_DS\_ResetCtrs
  + This command resets the command processed and command error counters to zero (0).
* TST\_DS\_SetCounters
  + This command sets several Data Storage (DS) counters so that the DS\_ResetCtrs command can be tested and verified.
* TST\_DS\_SendMessage
  + This command constructs a cFE Software Bus (SB) message using the supplied arguments. The arguments are the Message ID to send, the Message Type which determines the amount of data contained in the message and the data pattern for the data.
* TST\_DS\_SetSequenceCnt
  + This command sets the next sequence count in the SB message to the supplied count for the specified message type.
* TST\_DS\_SendTimeMessage
  + This command constructs a SB message using the supplied arguments as the message timestamp. The arguments are the Message ID to send which must be a TLM message since the timestamp is in the secondary header, the Message Type which determines the amount of data contained in the message, the data pattern for the data and the seconds and subseconds to use as the message timestamp.

The main DS test procedures do the following:

| **Procedure** | **Description** |
| --- | --- |
| ds\_filewrite | This test verifies that the CFS Data Storage (DS) application writes messages to files according to the requirements. Also, this test verifies the DS application commands and that DS handles anomalies appropriately. |
| ds\_filter | This test verifies that the CFS Data Storage (DS) application filters messages according to the requirements. This test also verifies that the DS application handles anomalies appropriately. |
| ds\_gencmds | This test verifies that the CFS Data Storage (DS) general commands function properly. The NOOP and Reset Counters commands will be tested. Invalid versions of these commands will also be tested to ensure that the DS application handled these properly. |
| ds\_movefile | This test verifies that the CFS Data Storage (DS) application writes messages to files according to the requirements and moves these files to the table-specified directory after they are closed.  **NOTE:** This test SHOULD NOT be executed if the Move Files configuration parameter is set to FALSE by the Mission. |
| ds\_resetcds | This test verifies that the CFS Data Storage (DS) application initializes the appropriate data items based upon the type of initialization that occurs (Application Reset, Processor Reset, or Power-On Reset). This test also verifies that the proper notifications occur if any anomalies exist with the data items stated in the requirements.  **NOTE:** This test SHOULD NOT be executed if the Make Tables Critical configuration parameter is set to 0 by the Mission. |
| ds\_resetnocds | This test verifies that the CFS Data Storage (DS) application initializes the appropriate data items based upon the type of initialization that occurs (Application Reset, Processor Reset, or Power-On Reset). This test also verifies that the proper notifications occur if any anomalies exist with the data items stated in the requirements. **NOTE:** This test SHOULD NOT be executed if the Make Tables Critical configuration parameter is set to 1 by the Mission. |

The test procedures described in the table below are called by at least one of the test procedures above.

|  |  |
| --- | --- |
| **Procedure** | **Description** |
| ds\_badfiletbls | This procedure creates seven Destination File Table load image files that each contain one of seven different errors that are checked by the table validation function. These files are used in the ds\_resetnocds test. |
| ds\_badfiltertbls | This procedure creates five Packet Filter Table load image files that each contain one of five different errors that are checked by the table validation function. These files are used in the ds\_resetnocds test. |
| ds\_start\_apps | This procedure performs all the necessary actions to start the DS and TST\_DS applications if they are not currently executing. |
| ds\_tbl1 | This procedure creates the initial Destination File and Packet Filter table load images for the ds\_gencmds test. |
| ds\_tbl2 | This procedure creates the initial Destination File and Packet Filter table load images for the ds\_filewrite test. |
| ds\_tbl3 | This procedure creates the initial Destination File and Packet Filter table load images for the ds\_filter, ds\_resetcds, and ds\_resetnocds tests. |
| ds\_tbl4 | This procedure creates the initial Destination File and Packet Filter table load images for the ds\_movefile test. |
| ds\_tbl5 | This creates a full CFS Data Storage (DS) Packet Filter Table load image file. |

The CFS Deployment Guide contains the instruction for how to set up both the CFS Flight and Ground test environment. The testers use a CFS Test Account for each build test. This account runs the Advanced Spacecraft Integration and System Test Software (ASIST) and is setup to contain all the files needed to test the application. These files are extracted from MKS, the source repository tool. Included in these files are test utilities. These utilities can be located in 2 places depending upon whether they are “local” or “global” utilities. The local utilities are extracted into the working prc directory ($WORK/prc). The global utilities are pointed to by ASIST in the global area defined on the test system. Additional tools utilized by the test procedures are located in the $TOOLS directory. It is assumed that test procedures and the ASIST telemetry database used for testing is built using procedure and database templates.

The following utilities were used during testing:

| **Name** | **Description** |
| --- | --- |
| CFE\_startup | Directive combines the "start\_data\_center", "open\_tlm", and "open cmd <cpu>" ASIST startup commands. |
| close\_data\_center | Directive that closes the command and telemetry connection to the CPU being used. |
| create\_tbl\_file\_from\_cvt | Procedure that creates a load file from the specified arguments and cvt |
| load\_start\_app | Procedure to load and start a user application from the /s/opr/accounts/cfstest/apps/cpux directory. |
| load\_table | Procedure that takes the specified file and transfers the file to the specified processor and then issues a TBL\_LOAD command using the file. |
| tst\_ds (version 2.4.0.0) | Test application required to test the DS application. |
| ut\_pfindicate | Directive to print the pass fail status of a particular requirement number. |
| ut\_runproc | Directive to formally run the procedure and capture the log file. |
| ut\_sendcmd | Directive to send EVS commands. Verifies command processed and command error counters. |
| ut\_sendrawcmd | Send raw commands to the spacecraft. Verifies command processed and command error counters. |
| ut\_setrequirements | A directive to set the status of the cFE requirements array. |
| ut\_setupevents | Directive to look for multiple events and increment a value for each event to indicate receipt. |
| ut\_tlmwait | Directive that waits for the specified telemetry condition to be met |
| ds\_file\_util | This is the executable of the ds\_file\_util.c program that takes a binary data file as its input and generates two output files. The only pertinent output file is the xxx\_raw.txt file where xxx is the original binary filename. |

## Version Information

|  |  |
| --- | --- |
| Item | Version |
| DS Requirements | 1.2 |
| DS Application | 2.4.0.0 |
| TST\_DS Application | 2.4.0.0 |
| CFE | 6.4.1.0 |
| OSAL | 4.1.1.0 |
| ASIST | 20.2 |
| VxWorks | 6.4 |

# Build Verification Test Preparation

## Scenerio Development

There were no new scenarios developed for DS 2.4.0.0 Build Verification Test. All scenarios are stored on the MKS server, in CFS-Repository DS test-and-ground directory within the Scenarios subdirectory. It should be noted that as DS requirements evolve these scenarios are not updated to reflect any changes made.

## Procedure Development and Execution

This build test was completed by running 6 test procedures. The ds\_resetcds and ds\_resetnocds procedures were modified to remove requirement DS9001.1 which was deleted in DS 2.4.0.0. The ds\_movefiles procedure was updated to provide additional instructions for running the test since it requires an alternate configuration of the DS flight software. The ds\_filewrite procedure was updated to account for the fix documented in DCR 21721. All test procedures were written using the STOL scripting language. The naming convention for files created by the test procedures was: scx\_cpu<#>\_<procedure name>\_GMT.<ext>.

## Test Products

Five log files were generated for every procedure that was run. They are defined as follows:

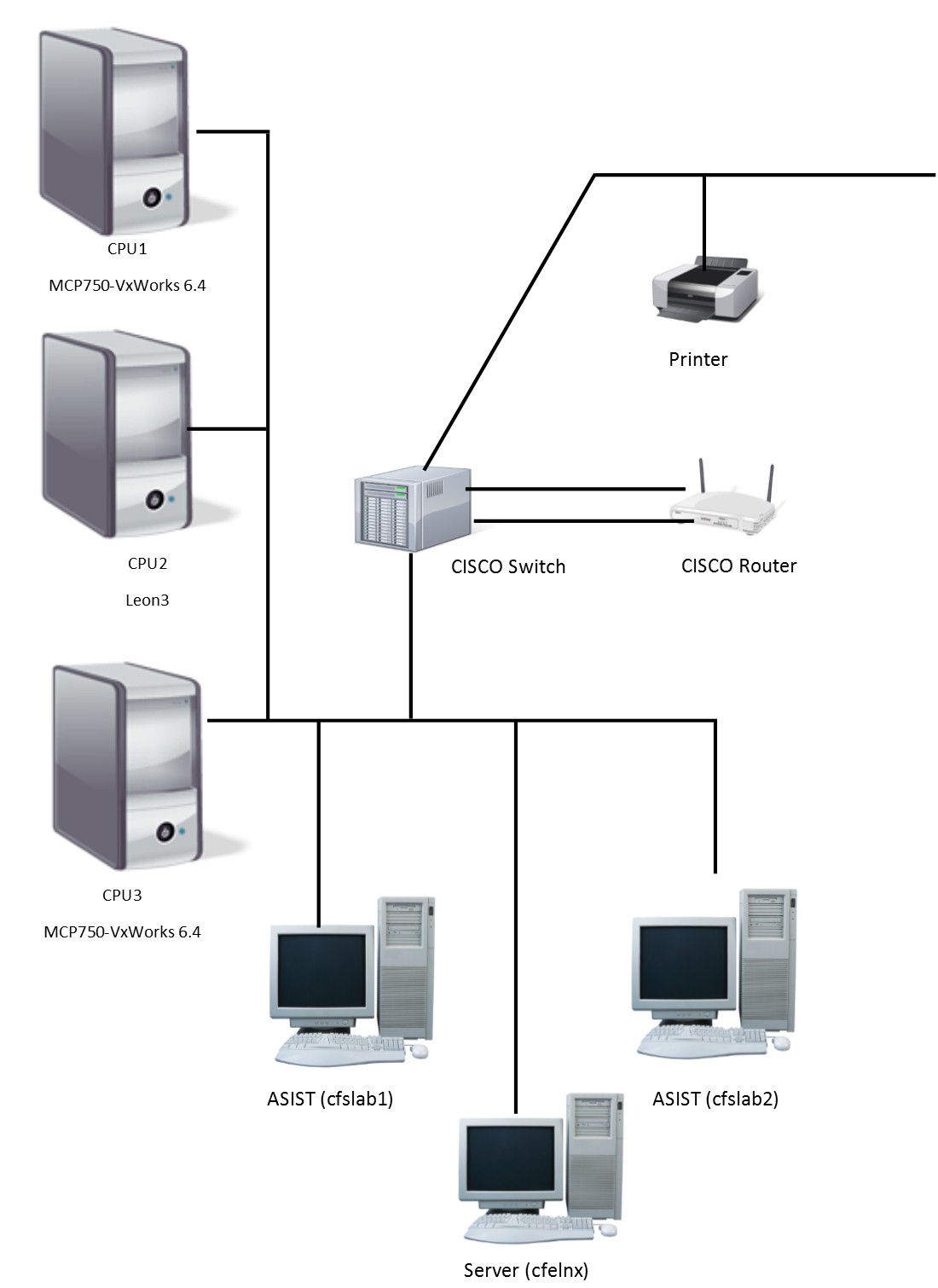
* Logs with the .loge extension list all events sent by the flight software
* Logs with the .logr extension list all requirements that passed validation by demonstration
* Logs with the .logp extension lists all prints that are generated by the test procedure
* Logs with the .logf extension lists everything from the other logs along with the steps in the test procedure
* Logs with the .logs extension lists the SFDU information (if applicable) contained in the full log.

A test summary report is developed in MKS for each procedure by the tester after build testing is completed. All test products are maintained on MKS in the CFS-Repository DS test-and-ground directory.

# Build Verification Test Execution

## Testbed Overview

DS FSW testing took place in the CFS FSW Development and Test Facility. A high level view of the CFS FSW Test Bed is shown in Figure 4-1. This facility is located in GSFC Building 23, Room N410. This facility consists of two ASIST workstations running ASIST version 20.2 and three MPC750 CPU boards running VxWorks 6.4. CPU1 is primarily used for development testing while CPU2 and CPU3 are used for build verification testing.

**Figure 4-1 CFS FSW Development and Testing Facility**

## Requirements Verification Matrix

|  |  |
| --- | --- |
|  | Data Storage  (DS) |
| Requirements Tested Passed | 57 |
| Requirements Tested Failed | 0 |
| Requirements Tested Partially | 0 |
| Total Tested | 57 |
| Deferred | 0 |
| Untestable | 0 |
| Total | 57 |

## Requirements Partially Tested

There were no requirements that were partially tested.

## Requirements/Functionality Deferred

No requirements were deferred to later build testing.

## Requirements/Functionality Deferred for Mission Testing

No requirements/functionality was deferred to mission testing:

# Build Verification Test Results

## Overall Assessment

During this build test of the DS Application, the software behaved as expected.

Below is a summary of the results:

* 46 requirements passed demonstration
* 11 requirements passed via analysis
* 5 DCRs were verified
* 1 new DCR was generated

## Procedure Description

| **Procedure** | **Description** | **Requirements tested** |
| --- | --- | --- |
| ds\_filewrite | This test verifies that the CFS Data Storage (DS) application writes messages to files according to the requirements. Also, this test verifies the DS application commands and that DS handles anomalies appropriately. | DS1002; DS1004; DS1005; DS3000; DS3000.1; DS3000.1.1; DS3000.2; DS3000.2.1; DS3001; DS3001.1; DS3001.2; DS3002; DS3002.1; DS3003; DS3004; DS3005; DS5000; DS5001; DS5002; DS5003; DS5004; DS5005; DS5006; DS5011; DS5012; DS5013; DS5014; DS5015; DS8000; DS9000 |
| ds\_filter | This test verifies that the CFS Data Storage (DS) application filters messages according to the requirements. This test also verifies that the DS application handles anomalies appropriately. | DS1002; DS1004; DS1005; DS2000; DS2000.1; DS2000.2; DS2001; DS2001.1; DS2002; DS2002.1; DS2003; DS2003.1; DS2003.2; DS3000; DS3000.1; DS3000.1.1; DS3000.2; DS3000.2.1; DS3003; DS3004; DS5002; DS5008; DS5009; DS5010; DS5016; DS5016.1; DS5016.2; DS5016.3; DS5016.4; DS8000; DS9000 |
| ds\_gencmds | This test verifies that the CFS Data Storage (DS) general commands function properly. The NOOP and Reset Counters commands will be tested. Invalid versions of these commands will also be tested to ensure that the DS application handled these properly. | DS1000; DS1001; DS1002; DS1004; DS1005; DS8000; DS9000 |
| ds\_movefile | This test verifies that the CFS Data Storage (DS) application writes messages to files according to the requirements and moves these files to the table-specified directory after they are closed.  **NOTE:** This test SHOULD NOT be executed if the Move Files configuration parameter is set to FALSE by the Mission. | DS1004; DS3000; DS3000.1; DS3000.1.1; DS3001; DS3001.1; DS3001.2; DS3002; DS3002.1; DS5002; DS8000; DS9000 |
| ds\_resetcds | This test verifies that the CFS Data Storage (DS) application initializes the appropriate data items based upon the type of initialization that occurs (Application Reset, Processor Reset, or Power-On Reset). This test also verifies that the proper notifications occur if any anomalies exist with the data items stated in the requirements.  **NOTE:** This test SHOULD NOT be executed if the Make Tables Critical configuration parameter is set to 0 by the Mission. | DS8000; DS9000; DS9001; DS9002; DS9003; DS9005; DS9006; DS9007 |
| ds\_resetnocds | This test verifies that the CFS Data Storage (DS) application initializes the appropriate data items based upon the type of initialization that occurs (Application Reset, Processor Reset, or Power-On Reset). This test also verifies that the proper notifications occur if any anomalies exist with the data items stated in the requirements. **NOTE:** This test SHOULD NOT be executed if the Make Tables Critical configuration parameter is set to 1 by the Mission. | DS8000; DS9000; DS9001; DS9002; DS9004; DS9005; DS9006; DS9007 |

## Analysis Requirements Verification

There were 11 requirements verified using analysis and are described below:

| **Requirement** | **Requirement Text** | **Analysis** |
| --- | --- | --- |
| DS2001 | DS shall store “N of X” messages starting at offset O. | Three tests were performed for this requirement in the Filter test procedure. The tests were N=1, X=3 and O=1; N=2, X=3 and O=1; and N=4, X=6 and O=2. The correct numbers of packets were stored in each test. However, the third test required some additional analysis to make sure the correct packets were stored. The CCSDS sequence counts for the 6 packets sent were 4 - 9. The mod 6 values for these packets were 4, 5, 0, 1, 2, 3 respectively. So, starting at offset 2, the next 4 packets will be stored. Thus, packets 4, 5, 2 and 3 should have been stored which they were. |
| DS2003 | The input argument to the filter algorithm shall be determined by the Filter Type indicator. | This requirement was passed in the Filter test procedure by sending a number of messages with Sequence based and Time based filtering. |
| DS2003.1 | If Filter Type indicates Sequence based filtering then the algorithm input argument is a value equal to the packet sequence count. | This requirement passed in the Filter test procedure with Step 3.13. As documented above for DS2001, the correct packets were received based upon the filtering parameters and the sequence count of the packet. |
| DS2003.2 | If Filter Type indicates Time based filtering then the algorithm input argument is a value created from the lower 11bits of packet timestamp seconds plus the high 4 bits of timestamp subseconds. | This requirement passed in the Filter test procedure with Step 3.16. As documented above for DS2001, the correct packets were received based upon the filtering parameters and the timestamp of the packet. |
| DS3000.1 | If the Filename Type indicates naming based on Sequence, the constructed filename will include a character representation of the Sequence Count value from the Destination File Table. | This requirement passed in the FileWrite and Filter test procedures. The output captured in the logp files verify that the character representation of the sequence count is contained in the filename. The FileWrite steps are 2.1.3, 2.2, 2.3.2, 2.6, 2.7, 3.1.1, 3.6, 3.9 and 3.14. The Filter steps are 2.1, 2.4.2, 2.8, 2.17, 3.3, 3.8 and 3.13. |
| DS3000.1.1 | If the Filename Type indicates naming based on Sequence, the value of the Sequence Count shall be incremented each time a file is created. | This requirement passed in the FileWrite and Filter test procedures. The output contained in the logp files verify that the sequence count incremented when each file was created. The FileWrite steps are 2.2, 2.3.2, 2.6, 2.7, 3.6 and 3.9. The Filter steps are 2.4.2, 2.8, 2.17, 3.3, 3.8 and 3.13. |
| DS3000.2 | If the Filename Type indicates naming based on Time, the constructed filename will include a character representation of the packet timestamp. | This requirement passed in the FileWrite and Filter test procedures. The output captured in the logp files verify that the packet timestamp was represented and formatted properly. The FileWrite step is 2.4.2 and the Filter steps are 2.2 and 2.14. |
| DS3000.2.1 | If the Filename Type indicates naming based on Time, the file date and time shall be represented in the following format:”YYYDDDHHMMSS”. | This requirement passed in the FileWrite and Filter test procedures. The output captured in the logp files verify that the packet timestamp was represented and formatted properly. The FileWrite step is 2.4.2 and the Filter steps are 2.2 and 2.14. |
| DS3001.2 | A minimum of one packet shall be written to a file. | This requirement passed in the FileWrite test procedure. Step 2.3.2 sends a message with 1500 data bytes to a destination whose maximum size is set to 1024 bytes. The file was created and closed when the next message for this ID is received in Step 2.6. The file was analyzed and found to contain only the packet sent in Step 2.3.2 |
| DS3003 | Each DS destination file shall contain a primary cFE file header with the following information:   1. Content Type 2. SubType 3. Primary header length 4. Spacecraft ID 5. Processor ID 6. Application ID 7. File creation time (seconds) 8. File creation time (sub-seconds) | This requirement passed in the FileWrite and Filter test procedures. The contents of each file were verified and contained the items specified. There was an additional 32 -byte description in the Primary header. |
| DS3004 | Each DS destination file shall contain a secondary file header with the following information:   1. File close time (seconds) 2. File close time (sub-seconds) 3. File table index 4. Qualified filename | This requirement passed in the FileWrite and Filter test procedures. The contents of each file were verified and contained the items specified. There was an additional 2-byte file table type in the Secondary header. |

## DCRs

The following DCR was generated during DS 2.4.0.0 testing:

|  |  |
| --- | --- |
| **DCR** | **Description** |
| 22879 | DS – When using critical tables, the Filter File Name in Housekeeping is cleared when the Filter Table is restored from the CDS |

### DCRs Verified

The following DCRs were verified during testing:

| **DCR** | **Description** | **Test Method** | **Test Approach** |
| --- | --- | --- | --- |
| 21035 | DS – Add Filter Table File Name to Housekeeping Telemetry | Test Procedure | The noted filename string was added to the DS Housekeeping packet RDL and display page and verified that it contained the correct filename.while running the ds\_gencmds test. |
| 21721 | DS – Ignored Packet Counter Incremented ON Receipt of DS Commands and Housekeeping Requests | Test Procedure | For the duration of the ds\_filewrite test, the Ignored Packet counter did not increment when any DS command or Housekeeping Request was received. |
| 21732 | DS Doxygen Users Guide Does Not Include Context Diagram | Inspection | The context diagram was found in the User’s Guide |
| 21749 | DS Fails to Startup Disabled When Initialization of Any Table Fails | Test Procedure | Requirement 9001.1 was deleted. The ds\_resetcds and ds\_resetnocds were modified to remove these tests. |
| 22032 | Incorrect event description for DS\_GET\_FILE\_INFO\_CMD\_EID | Inspection | The text from the DCR solution was found in ds\_events.h. |

### Outstanding DCRs

|  |  |
| --- | --- |
| **DCR** | **Description** |
| 18529 | DS – Reduce Telemetry Bandwith |
| 22007 | DS – Add Trick Simulation Support (JSC Request) |
| 22023 | DS – Unsubscribing to Filter Messages May Cause Flooding of SB No Subscribers Event |
| 22104 | DS Sequence Counter Will Always Roll Over to Zero |
| 22879 | DS – When using critical tables, the Filter File Name in Housekeeping is cleared when the Filter Table is restored from the CDS |

## Notes

The ds\_resetcds test procedure was executed with a version of the DS software that had the DS\_MAKE\_TABLES\_CRITICAL configuration parameter set to 1. The default delivered with DS is 0.

The ds\_movefile test procedure was executed with a version of the DS software that had the DS\_MOVE\_FILES configuration parameter set to TRUE. The default delivered with DS is FALSE.

It should be noted that integration testing is the ultimate verification of the DS application’s performance in a system-like scenario.

1. RTTM

The DS Build 2.4.0.0 RTTM can be found on the MKS server, in CFS-Repository DS test-and-ground directory results folder.

1. Command, Telemetry, and Events Verification Matrix

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| **Command** | **Test Procedure(s)** | **Notes/Comments** |
| DS\_NOOP | GenCmds |  |
| DS\_ResetCtrs | GenCmds |  |
| DS\_Enable | FileWrite |  |
| DS\_Disable | FileWrite |  |
| DS\_SetFilterFile | Filter |  |
| DS\_SetFilterType | Filter |  |
| DS\_SetFilterParams | Filter, ResetCDS |  |
| DS\_SetFileType | FileWrite |  |
| DS\_EnableFile | FileWrite |  |
| DS\_DisableFile | FileWrite |  |
| DS\_SetPath | FileWrite, ResetCDS |  |
| DS\_SetBasename | FileWrite, ResetCDS |  |
| DS\_SetExtension | FileWrite |  |
| DS\_SetMaxFileSize | FileWrite |  |
| DS\_SetMaxFileAge | FileWrite |  |
| DS\_SetFileSeqCtr | FileWrite |  |
| DS\_CloseFile | FileWrite, Filter, MoveFile |  |
| DS\_GetFileInfo | All |  |
| DS\_AddMID | Filter |  |
| DS\_CloseAllFiles | FileWrite |  |

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| **Telemetry** | **Test Procedure(s)** | **Notes/Comments** |
| DS\_CMDPC | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_CMDEC | FileWrite, Filter, GenCmds, MoveFile,ResetCDS, ResetNoCDS |  |
| DS\_DisabledPktCnt | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_IgnoredPktCnt | GenCmds, ResetNoCDS |  |
| DS\_FilteredPktCnt | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_PassedPktCnt | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_FileWriteCnt | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_FileWriteErrCnt | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_FileUpdCnt | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_FileUpdErrCnt | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_DestLoadCnt | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_DestPtrErrCnt | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_FilterLoadCnt | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_FilterPtrErrCnt | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_AppEnaState | FileWrite |  |
| DS\_FileState[].FileAge | FileWrite, MoveFile |  |
| DS\_FileState[].FileSize | FileWrite |  |
| DS\_FileState[].FileRate |  |  |
| DS\_FileState[].FileSeq |  |  |
| DS\_FileState[].EnableState | FileWrite |  |
| DS\_FileState[].OpenState | FileWrite, MoveFile |  |
| DS\_FileState[].FileName | FileWrite, Filter, MoveFile, ResetCDS, ResetNoCDS |  |
| **Table Telemetry** |  |  |
| DS\_DF\_TBL\_Description | BadFileTbls, Tbl1, Tbl2, Tbl3, Tbl4 | Table Load setup procedures |
| DS\_DF\_TBL[].MoveDirName | MoveFile, Tbl4 |  |
| DS\_DF\_TBL[].Pathname | FileWrite, MoveFile, ResetCDS |  |
| DS\_DF\_TBL[].Basename | FileWrite, ResetCDS |  |
| DS\_DF\_TBL[].Extension | FileWrite |  |
| DS\_DF\_TBL[].FileNameType | FileWrite, Filter, MoveFile, ResetCDS, ResetNoCDS |  |
| DS\_DF\_TBL[].FileState | FileWrite |  |
| DS\_DF\_TBL[].FileSize | FileWrite |  |
| DS\_DF\_TBL[].FileAge | FileWrite, MoveFile |  |
| DS\_DF\_TBL[].SeqCnt | FileWrite |  |
| DS\_PF\_TBL\_Description | BadFilterTbls, Tbl1, Tbl2, Tbl3, Tbl4, Tbl5 | Table Load setup procedures |
| DS\_PF\_TBL[].Index | FileWrite, Filter, MoveFile |  |
| DS\_PF\_TBL[].FilterType | Filter |  |
| DS\_PF\_TBL[].N\_Value | Filter, ResetCDS |  |
| DS\_PF\_TBL[].X\_Value | Filter, ResetCDS |  |
| DS\_PF\_TBL[].O\_Value | Filter, ResetCDS |  |

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| **Id** | **Event Message** | **Test Procedure(s)** | **Notes/Comments** |
| 1 | DS\_INIT\_EID | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| 2 | DS\_INIT\_ERR\_EID |  |  |
| 3 | DS\_EXIT\_ERR\_EID |  |  |
| 6 | DS\_INIT\_CDS\_ERR\_EID |  |  |
| 7 | DS\_INIT\_TBL\_CDS\_EID |  |  |
| 8 | DS\_INIT\_TBL\_ERR\_EID | Filter, ResetCDS, ResetNoCDS |  |
| 10 | DS\_FIL\_TBL\_EID | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| 11 | DS\_FIL\_TBL\_ERR\_EID | ResetNoCDS |  |
| 12 | DS\_FLT\_TBL\_EID | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| 13 | DS\_FLT\_TBL\_ERR\_EID | ResetNoCDS |  |
| 14 | DS\_FILE\_NAME\_ERR\_EID |  |  |
| 15 | DS\_CREATE\_FILE\_ERR\_EID | FileWrite |  |
| 16 | DS\_WRITE\_FILE\_ERR\_EID |  |  |
| 21 | DS\_CMD\_CODE\_ERR\_EID | GenCmds |  |
| 22 | DS\_HK\_REQUEST\_ERR\_EID | GenCmds |  |
| 31 | DS\_NOOP\_CMD\_EID | GenCmds |  |
| 32 | DS\_NOOP\_CMD\_ERR\_EID | GenCmds |  |
| 33 | DS\_RESET\_CMD\_EID | GenCmds |  |
| 34 | DS\_RESET\_CMD\_ERR\_EID | GenCmds |  |
| 35 | DS\_ENADIS\_CMD\_EID | FileWrite |  |
| 36 | DS\_ENADIS\_CMD\_ERR\_EID | FileWrite |  |
| 37 | DS\_FILE\_CMD\_EID | Filter |  |
| 38 | DS\_FILE\_CMD\_ERR\_EID | Filter |  |
| 39 | DS\_FTYPE\_CMD\_EID | Filter |  |
| 40 | DS\_FTYPE\_CMD\_ERR\_EID | Filter |  |
| 41 | DS\_PARMS\_CMD\_EID | Filter, ResetCDS |  |
| 42 | DS\_PARMS\_CMD\_ERR\_EID | Filter |  |
| 43 | DS\_NTYPE\_CMD\_EID | FileWrite |  |
| 44 | DS\_NTYPE\_CMD\_ERR\_EID | FileWrite |  |
| 45 | DS\_STATE\_CMD\_EID | FileWrite |  |
| 46 | DS\_STATE\_CMD\_ERR\_EID | FileWrite |  |
| 47 | DS\_PATH\_CMD\_EID | FileWrite, ResetCDS |  |
| 48 | DS\_PATH\_CMD\_ERR\_EID | FileWrite |  |
| 49 | DS\_BASE\_CMD\_EID | FileWrite, ResetCDS |  |
| 50 | DS\_BASE\_CMD\_ERR\_EID | FileWrite |  |
| 51 | DS\_EXT\_CMD\_EID | FileWrite |  |
| 52 | DS\_EXT\_CMD\_ERR\_EID | FileWrite |  |
| 53 | DS\_SIZE\_CMD\_EID | FileWrite |  |
| 54 | DS\_SIZE\_CMD\_ERR\_EID | FileWrite |  |
| 55 | DS\_AGE\_CMD\_EID | FileWrite |  |
| 56 | DS\_AGE\_CMD\_ERR\_EID | FileWrite |  |
| 57 | DS\_SEQ\_CMD\_EID | FileWrite |  |
| 58 | DS\_SEQ\_CMD\_ERR\_EID | FileWrite |  |
| 59 | DS\_CLOSE\_CMD\_EID | FileWrite, Filter, MoveFile |  |
| 60 | DS\_CLOSE\_CMD\_ERR\_EID | FileWrite |  |
| 61 | DS\_MOVE\_FILE\_ERR\_EID |  |  |
| 62 | DS\_GET\_FILE\_INFO\_CMD\_EID | FileWrite, Filter, GenCmds, MoveFile, ResetCDS, ResetNoCDS |  |
| 63 | DS\_GET\_FILE\_INFO\_CMD\_ERR\_EID |  |  |
| 64 | DS\_ADD\_MID\_CMD\_EID | Filter |  |
| 65 | DS\_ADD\_MID\_CMD\_ERR\_EID | Filter |  |
| 66 | DS\_CLOSE\_ALL\_CMD\_EID | FileWrite |  |
| 67 | DS\_CLOSE\_ALL\_CMD\_ERR\_EID | FileWrite |  |